CLAIMS

What is claimed is:

1. A method of subdividing a first mesh representation of an object surface bounded by one or more boundary curves to form a second subdivided mesh representation, the first mesh representation comprising a plurality of tessellated polygons, each of the polygons having one or more vertices, the method comprising the following steps:

subdividing one or more of the polygons into child polygons, each of the child polygons having one or more vertices;

determining locations of the vertices of the child polygons; and

maintaining boundary vertices of the child polygons on one or more of the boundary curves.

2. The method of claim 1 further comprising associating detail vectors with one or more corresponding vertices of the child polygons.

3. The method of claim 2 further comprising adjusting the locations of one or more vertices of child polygons using the detail vectors.

4. The method of claim 1 further comprising subdividing the second mesh representation one or more times until any error between it and the object surface is less than a prescribed tolerance value.

5. The method of claim 1 wherein said determining step includes determining the location of an interior vertex in the second mesh representation by weighting the locations of adjacent vertices in the first mesh representation, and adding the weighted locations.

6. The method of claim 1 wherein said determining step includes determining the location of a corner vertex in the second mesh representation by setting it to the location of the corner vertex in the first mesh representation.

7. The method of claim 1 wherein said determining step includes determining the location of a boundary vertex in the second mesh representation by determining one or more parameters of a boundary curve corresponding to adjacent vertices in the first mesh representation, weighting the one or more parameters, and adding the weighted parameters to determine a parameter for the boundary vertex.

8. The method of claim 7 further comprising determining the location of the boundary vertex from the parameter of the boundary vertex.

9. A method of subdividing a first mesh representation of an object surface bounded by one or more boundary curves to form a second subdivided mesh representation, the first mesh representation comprising a plurality of tessellated polygons, each of the polygons having one or more vertices, the method comprising the following steps:

subdividing one or more of the polygons into child polygons, each of the child polygons having one or more vertices;

determining locations of the vertices of the child polygons;

maintaining boundary vertices of the child polygons on one or more of the boundary curves; and

associating detail vectors with one or more corresponding vertices of the child polygons.

10. The method of claim 9 wherein said determining step includes determining the location of an interior even vertex by weighting the locations of the interior even vertex and its adjacent vertices in the first mesh representation, and adding the weighted locations.

11. The method of claim 9 wherein said determining step includes determining the location of an interior odd vertex by weighting the locations of adjacent vertices in the first mesh representation, and adding the weighted locations.

12. The method of claim 9 wherein said determining step includes determining the location of an interior vertex adjacent to a corner vertex by weighting the locations of adjacent vertices in the first mesh representation, adding the weighted locations, and deriving the location of the interior vertex from the weighted sum.

13. The method of claim 9 wherein said determining step includes determining a parameter of an even boundary vertex on a boundary curve by determining parameters for the even boundary vertex and adjacent vertices in the first mesh representation, weighting the parameters, and adding the weighted parameters.

14. The method of claim 9 wherein said determining step includes determining a parameter of an odd boundary vertex on a boundary curve by determining parameters for adjacent vertices in the first mesh representation, and adding the weighted parameters.

15. The method of claim 9 wherein said determining step includes determining a parameter of a corner vertex on a boundary curve by setting it to the parameter corresponding to the corner vertex in the first mesh representation.

16. The method of claim 9 wherein said associating step comprises propagating detail vectors from vertices in the first mesh representation to vertices in the second mesh representation.

17. The method of claim 9 wherein said associating step comprises importing detail vectors from another source.

18. A representation of an object surface resulting from performing any of the methods of claims 1, 4, and 9.

19. A memory tangibly embodying any of the methods of claims 1, 4, and 9.

20. A processor readable medium tangibly embodying any of the methods of claims 1, 4, and 9.

21. A representation of an object surface bounded by one or more boundary curves comprising:

a mesh representation comprising a mesh of polygons, with boundary vertices thereof located on or more of the boundary curves, the mesh representation having a limit surface; and

detail vectors corresponding to one or more polygon vertices which converge to limit points on the limit surface, wherein a detail vector for a vertex relates to the shape of the limit surface near the limit point corresponding to the vertex.

22. The representation of claim 21 wherein a detail vector for a vertex relates to the second derivative of the limit surface near the limit point corresponding to the vertex.

23. The representation of claim 21 wherein the mesh representation comprises a mesh of subdivided or repeatedly subdivided polygons.

24. A memory tangibly embodying the surface representation of claim 21.

25. A processor readable medium tangibly embodying the surface representation of claim 21.

26. A system comprising:

the processor readable medium of claim 20; and

a processor configured to perform the method tangibly embodied by the processor readable medium.

27. A system comprising:

the processor readable medium of claim 25; and

a processor configured to access the surface representation tangibly embodied by the processor readable medium.

28. The system of claim 26 further comprising a CAD device for providing to the processor the first mesh representation or data from which this first mesh representation is derived.

29. The system of claim 27 further comprising a CAM device which is configured to receive the surface representation as accessed by the processor.

30. A client/server system in which either the client or the server comprises the system of any of claims 26 and 27.

31. A client/server system in which either the client or the server includes the processor readable medium of any of claims 20 and 25.

32. A client/server system in which either the client or server includes the memory of any of claims 19 and 24.

33. A method of subdividing a first mesh representation of an object surface bounded by one or more boundary curves to form a second subdivided mesh representation, the first mesh representation comprising a plurality of tessellated polygons, each of the polygons having one or more vertices, the method comprising the following steps:

a step for subdividing one or more of the polygons into child polygons, each of the child polygons having one or more vertices;

a step for determining locations of the vertices of the child polygons; and

a step for maintaining boundary vertices of the child polygons on one or more of the boundary curves.

34. The method of claim 33 further comprising:

a step for associating detail vectors with one or more corresponding vertices of the child polygons.

35. A representation of an object surface comprising:

mesh representation means for representing the object surface with a mesh of polygons; and

detail vector means for representing the shape of a limit surface corresponding to the mesh representation means.

36. A system comprising:

medium means for tangibly embodying any of the methods of claims 33 and 34; and

processor means for performing any of the methods tangibly embodied by the medium means.

37. A system comprising:

medium means for tangibly embodying the representation of claim 35; and

processor means for accessing the representation tangibly embodied by the medium means.